FloodSAFE CALIFORNIA

BWFS/CS Technical Workshop #2

Technical Session B1:
Climate Change Vulnerability Analysis

October 23, 2013

PUBLIC SAFETY ENVIRONMENTAL STEWARDSHIP ECONOMIC STABILITY

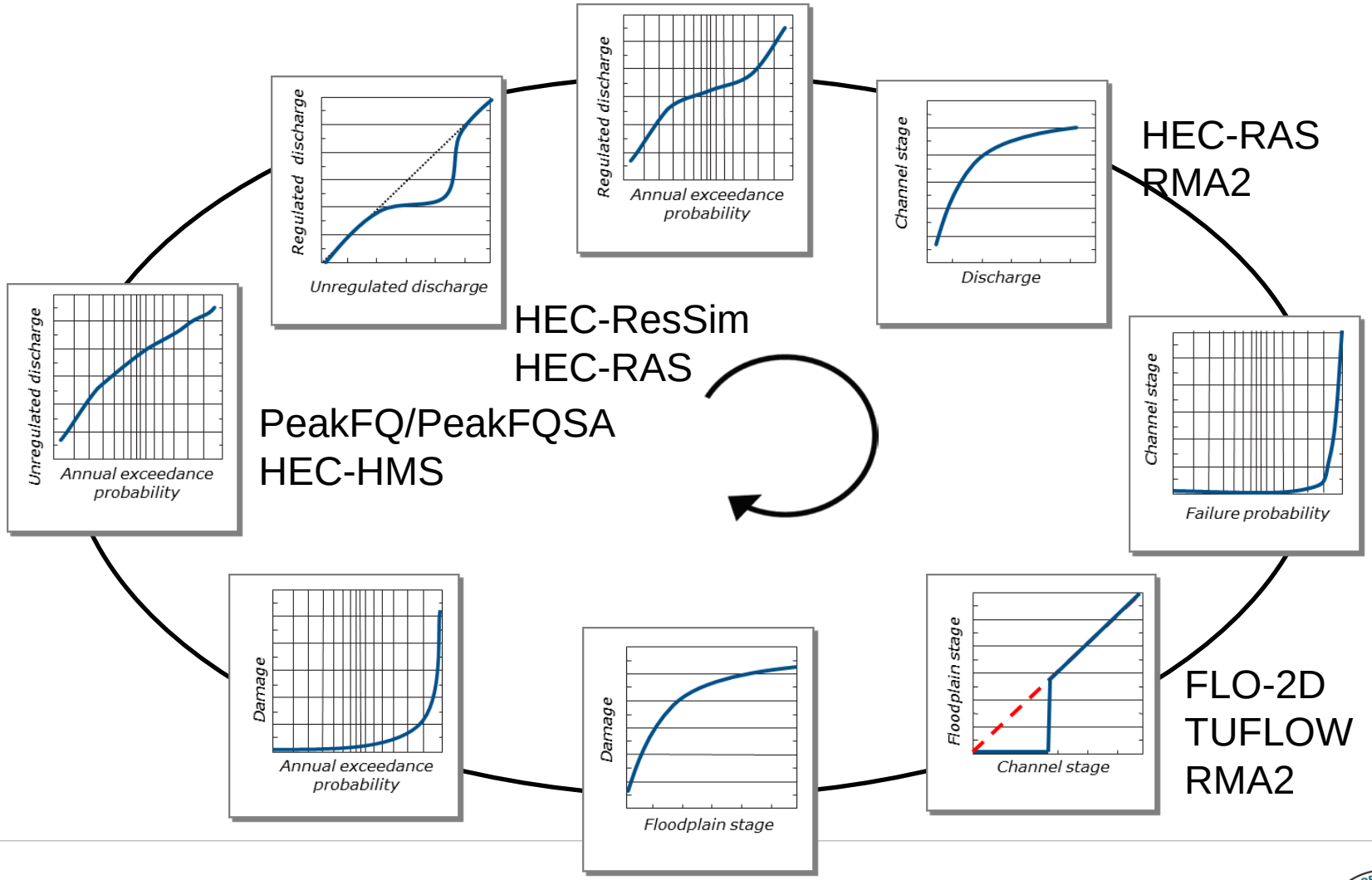
Background and Overview

- SB 5 (2007) requires climate change considerations incorporated in the Central Valley Flood Protection Plan (CVFPP)
- DWR has completed 2012 CVFPP with considerations of climate change, but more to be done
- Presentation focus:
  - Provide overview of the CVFPP approach to incorporate climate change
  - Describe how climate change is incorporated into the Hydrologic and Hydraulic tools/analysis to measure flood system vulnerability under future conditions

Objectives to be evaluated by H&H tools

Objective Topic
1. People and Property at Risk 1a. Urban Flood Protection 1b. Small Community Flood Risk Reduction 1c. Rural-agricultural Area Flood Risk Reduction
2. Flood System Flexibility
3. Flood System Resiliency
4. Wise Floodplain Management
5. Ecosystem Processes 5a. Inundated Floodplain
15. Integrated Water Management

Risk analysis



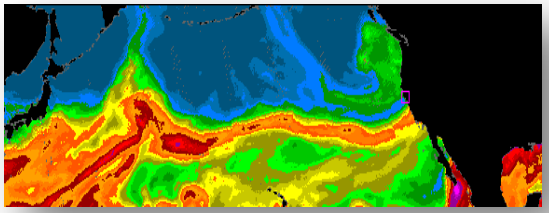
Climate Change and H&H Modeling

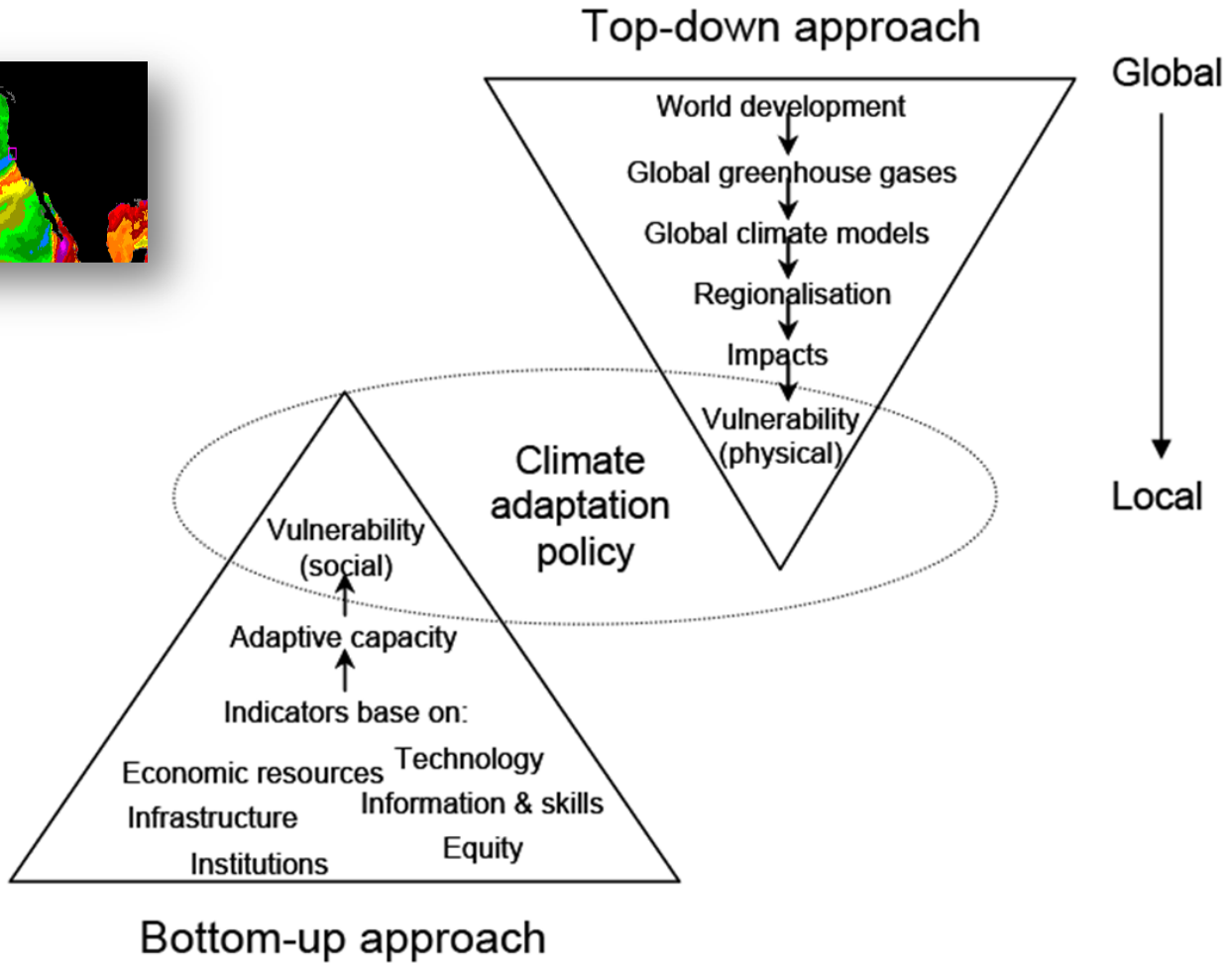
Factors influencing the boundary conditions

1. **Upstream Boundary Conditions**
   - Temperature Changes (Snowpack size and snowmelt)
   - Precipitation Timing and Form (rain or snow) Changes
2. **Downstream Boundary Conditions**

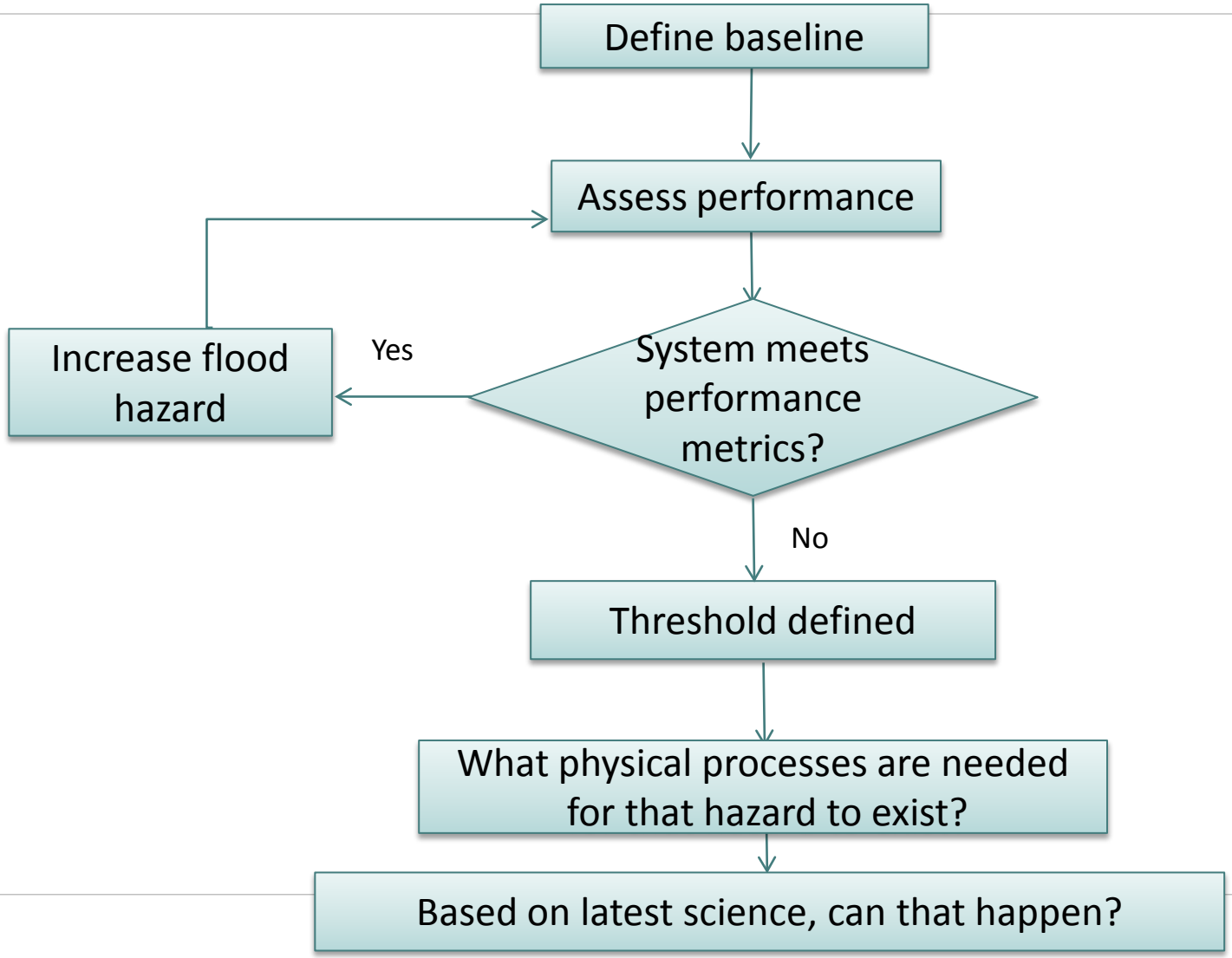
   Sea-level Rise

Threshold Analysis Approach





Concept of the Threshold Approach

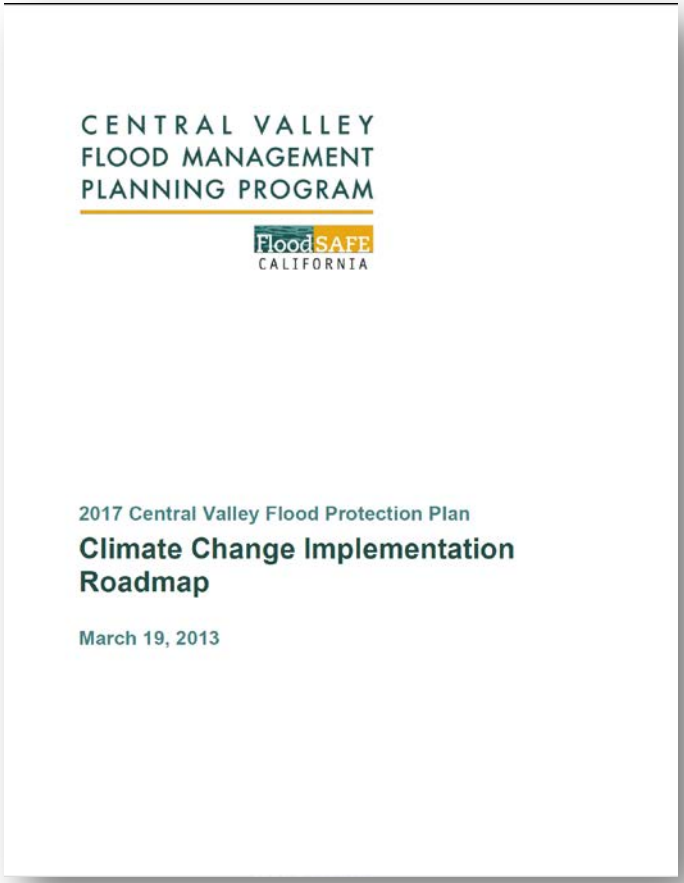


Demonstration of the Approach

- Pilot Study
  - Proof of concept
  - Question: What threshold of climate change will impact Feather/Yuba River subsystem elements?

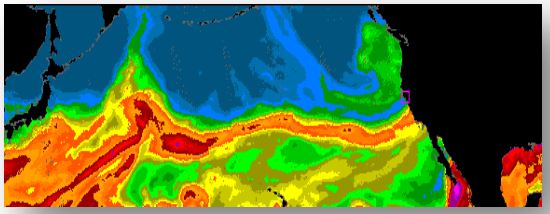
Looking forward

- Two-sides to the challenge
  - Watershed hydrology
  - Sea Level Rise
- Continued challenges in availability and timing of preferred, dependent products
- Best available information to proceed with a scientifically credible approach

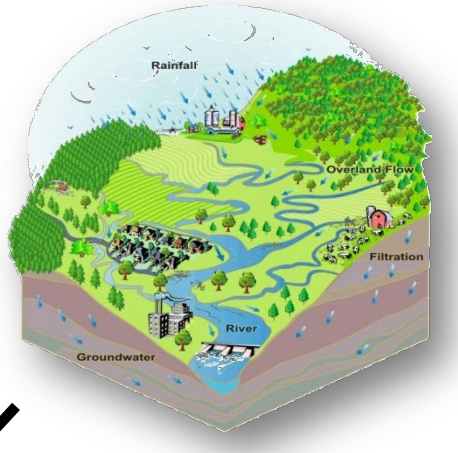


1. Upstream Boundary Conditions

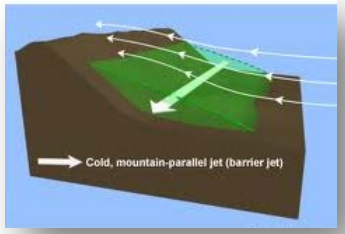
Factors influencing upstream boundary conditions



Atmospheric River Event Characteristics

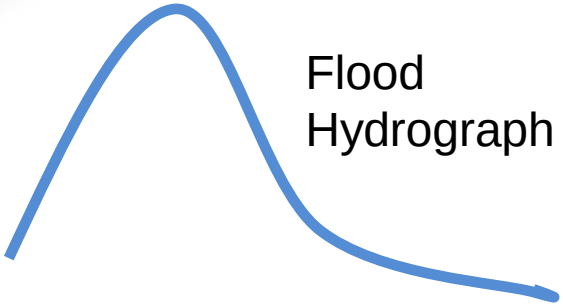


Watershed Conditions and Features



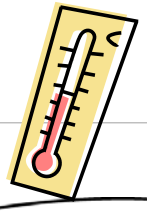
Local Storm Characteristics

Design Rainfall Event



Flood Hydrograph

Temperature

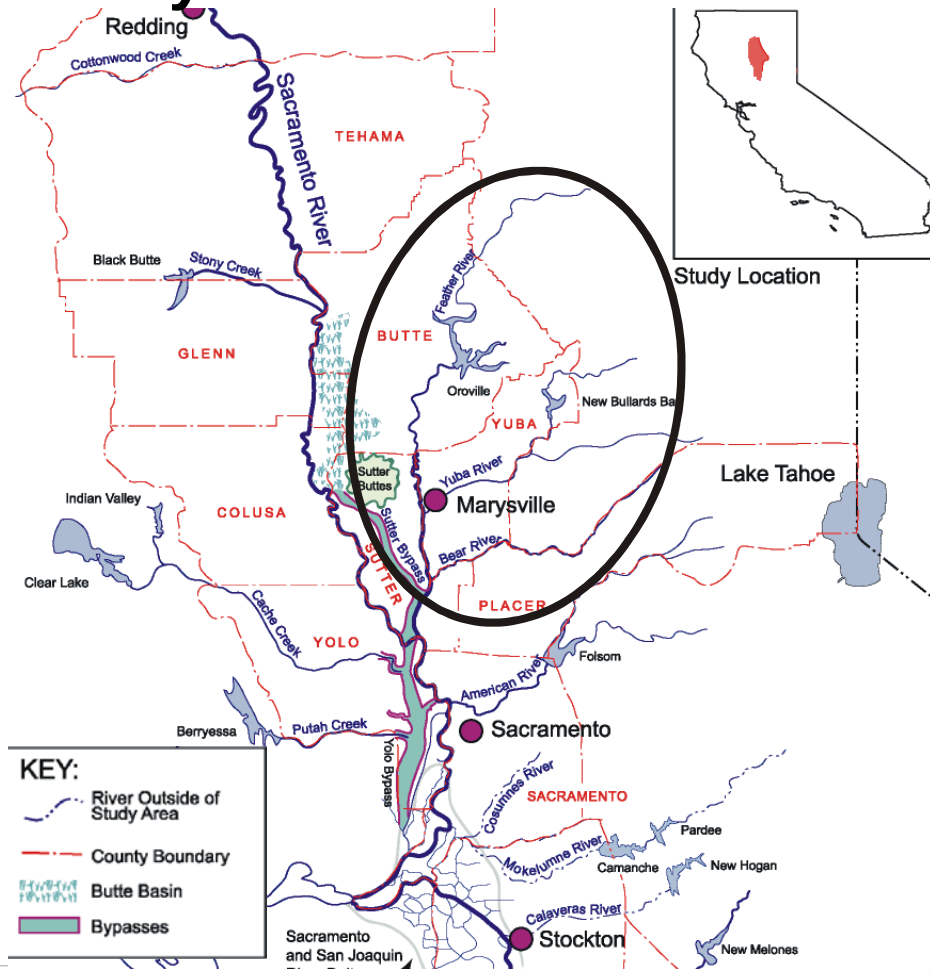


Flood Risk Evaluation and Flood Management Planning

1. Upstream Boundary Conditions – Temperature Factor

Climate Variability Sensitivity Study

- Questions:
  - How would watersheds respond to increases in temperature?
  - How would our flood control system respond?
- 2 watersheds analyzed so far:
  - Feather River (above Nicolaus).
  - Merced River (above Newman)
- Work ongoing by USACE



2. Downstream Boundary Conditions

Sea Level Rise Considerations and storm surges, tides, etc.

Hurricane Sandy Pushed Record Storm Surge Into Manhattan (Oct 28, 2012)

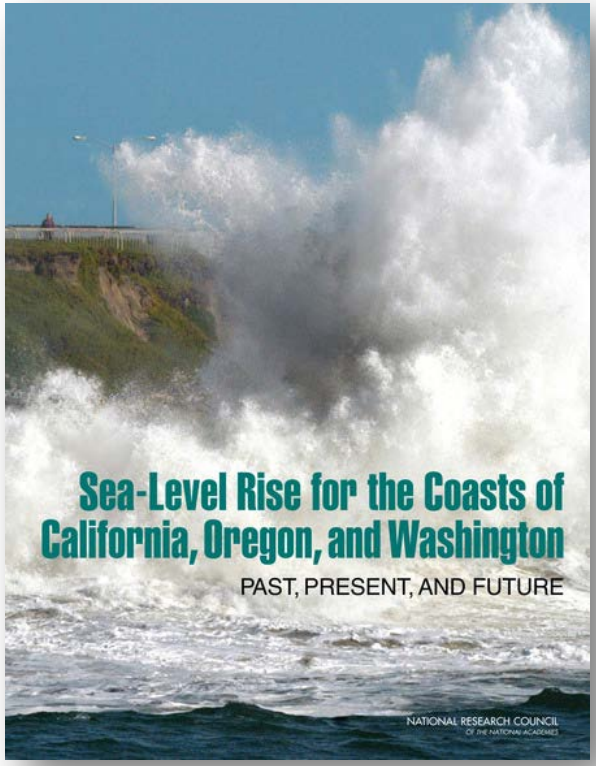
2. Downstream Boundary Conditions

National Research Council Review

- Executive Order S-13-08
- DWR's contract with NRC with funds from CA, OR, WA, NOAA, USGS, and USACE

	2030	2050	2100
Global	8-23	18-48	50-140
CA	4-30	12-61	42-167

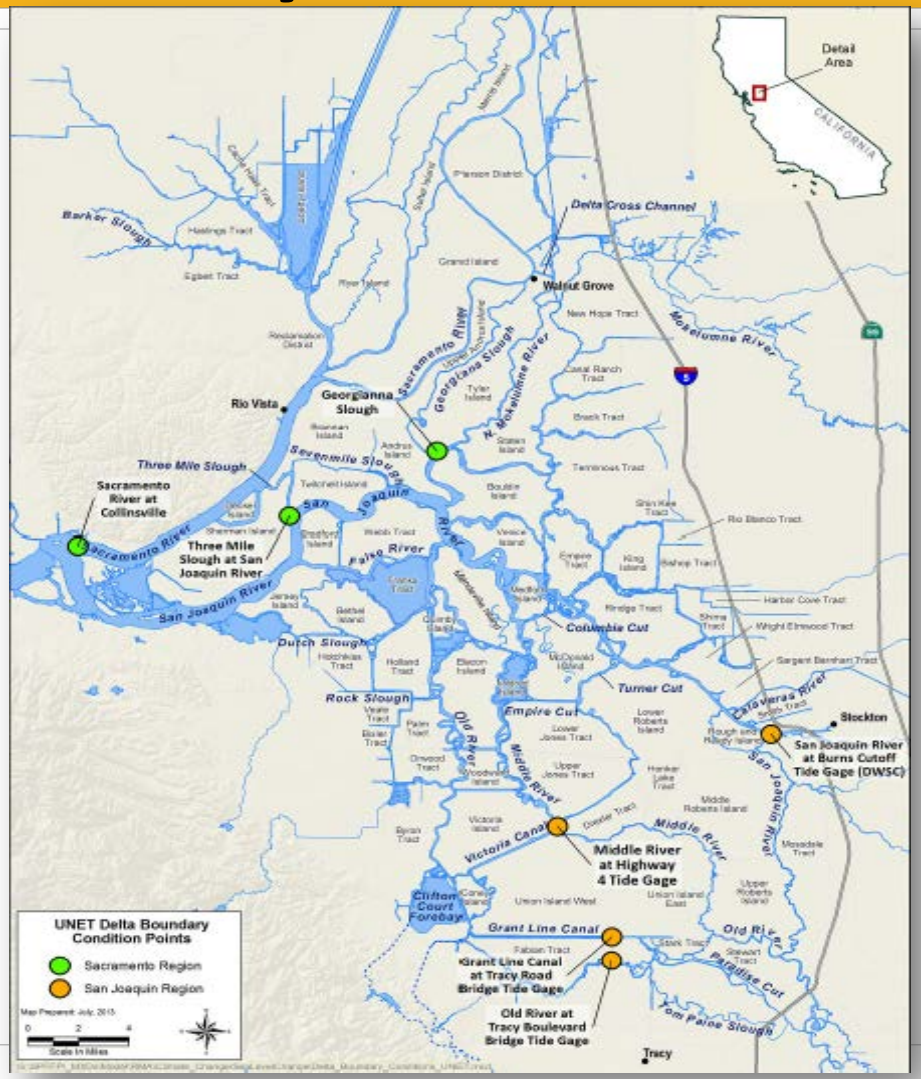
Projected increase in cm, with base year 2000



NRC, June 2012

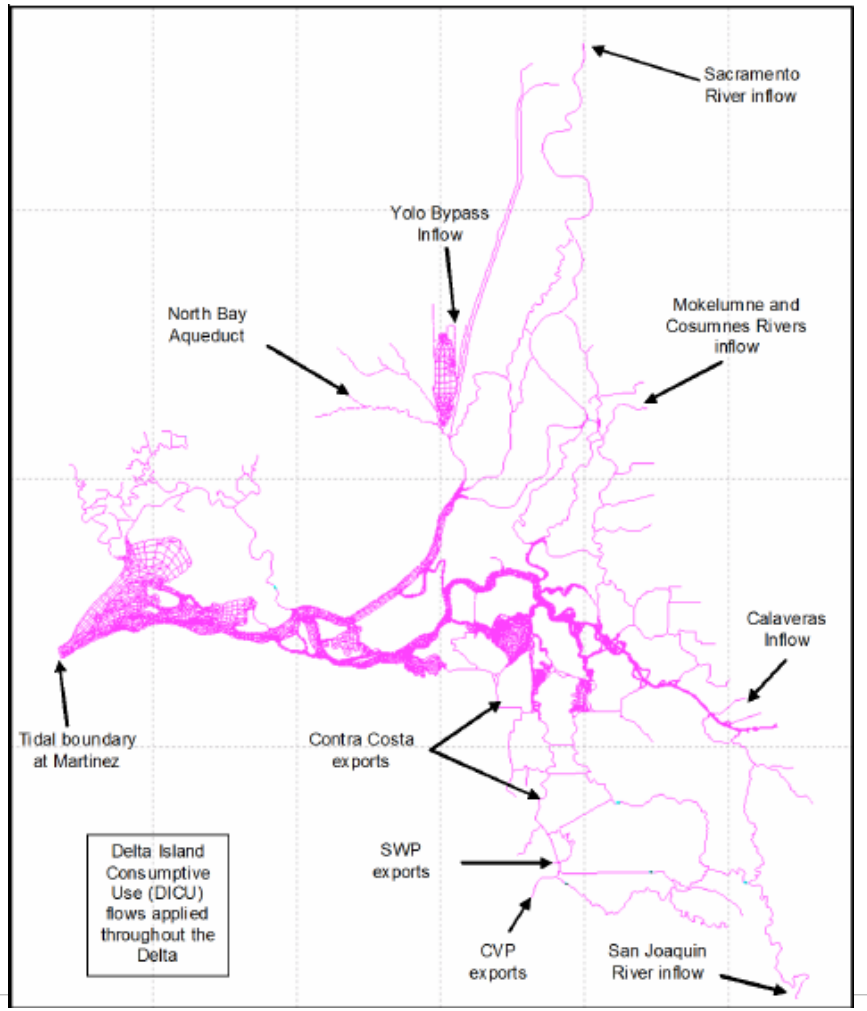
2. Downstream Boundary Conditions

- Riverine hydraulic models (HEC-RAS) have boundary conditions subject to **tidal** influence
- NRC SLR info at Golden Gate



2. Downstream Boundary Conditions

- Use of RMA2 Bay-Delta Model
  - Upstream BC's (stages from various storm events)
  - Downstream BC's (NRC + 1997 tides)

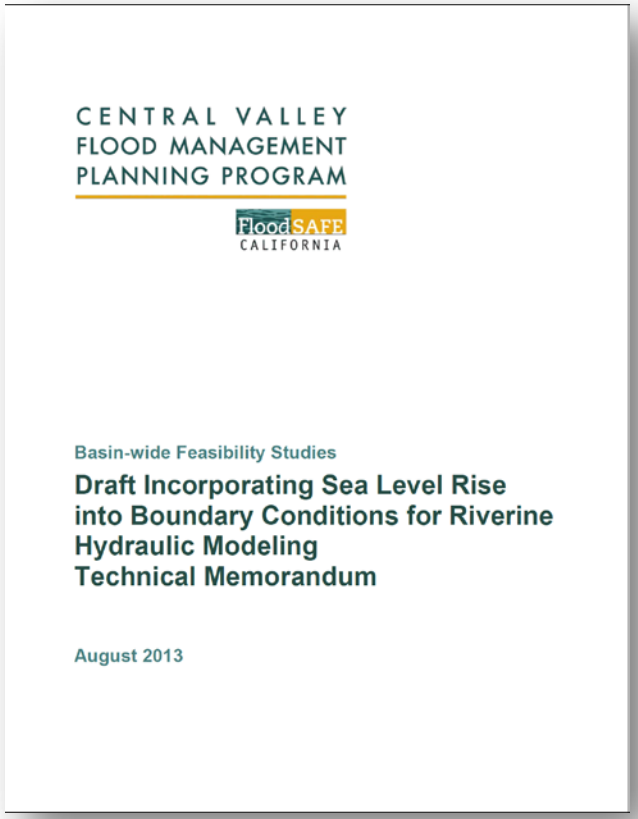


BC's for Riverine Hydraulic Models

Table 3-1. Change in Maximum Stage: Sacramento River at Collinsville

		Simulated Increase in Maximum Stage (feet)					
		Projected Year 2030 Sea Level Rise			Projected Year 2050 Sea Level Rise		
		4.3 cm (0.14 ft)	14.4 cm (0.47 ft)	29.7 cm (0.97 ft)	12.3 cm (0.40 ft)	28 cm (0.92 ft)	60.8 cm (1.99 ft)
Storm Event (% AEP)	**10**	0.13	0.44	0.91	0.38	0.86	1.87
	4	0.12	0.41	0.88	0.35	0.83	1.83
	2	0.12	0.41	0.84	0.35	0.79	1.72
	1	0.12	0.40	0.82	0.34	0.77	1.66
	0.5	0.11	0.37	0.77	0.32	0.72	1.54
	0.02	0.08	0.26	0.56	0.22	0.52	1.17

Key:
AEP = annual exceedence probability
cm = centimeter
ft = foot



See Rpt. Chapter 3 for full results

Looking Ahead – CC Considerations

- Continue with road map implementation
- Advance research and application of knowledge of atmospheric rivers for the long-term vision
- Use surrogate information to advance current planning process
- and ADAPT

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Questions on Climate Change Science?

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